Marking guide | Algebra

Algebra - practice test 3

16 questions | 46 marks | 60 minutes

Interpret costs, lengths, shared quantities and algebraic claims in practical situations.

Equivalent correct methods earn the corresponding marks.

1. A shop sells x boxes and then $3x$ more. Express the total. [1 mark]

$x + 3x = 4x$.

Answer: $4x$

2. A student buys 5 pens costing p dollars each and a notebook costing 7 dollars. Write the total cost. [2 marks]

Multiply the pen price by 5, then add 7.

Answer: $5p + 7$ dollars

3. Two classes collect $7n + 4$ and $3n - 1$ bottles. Simplify the combined total. [2 marks]

$7n + 4 + 3n - 1 = 10n + 3$.

Answer: $10n + 3$ bottles

4. A rectangular strip is 3 cm wide and $(2x + 5)$ cm long. Expand its area expression. [3 marks]

$A = 3(2x + 5) = 6x + 15$.

Answer: $6x + 15$ cm^2

5. A group shares $8x + 12$ tokens equally among four people. Factorise the total to show the shares and give one share. [3 marks]

Both terms divide by 4: $8x + 12 = 4(2x + 3)$.

Answer: $4(2x + 3)$; one share is $2x + 3$.

6. A phone plan costs $C = 12 + 5g$ dollars for g GB. Find the cost for 7 GB. [2 marks]

$C = 12 + 5(7) = 47$.

Answer: 47

7. Route lengths are $4(x + 2)$ km and $(4x + 5)$ km. Which is longer, and by how much? [3 marks]

$4(x + 2) = 4x + 8$.

$(4x + 8) - (4x + 5) = 3$ km.

Answer: The first route is 3 km longer.

8. A student claims three bags each containing $(x - 2)$ objects contain $3x - 2$ objects altogether. Correct the expression. [3 marks]

$3(x - 2) = 3x - 6$.

Two objects are removed from each of the three groups.

Answer: $3x - 6$ objects

9. A rectangle has perimeter P, length l and width w, with $P = 2l + 2w$. [4 marks]

(a) Make w the subject. [2 marks]

Subtract $2l$ and divide by 2.

Answer: $w = \frac{P - 2l}{2}$

(b) Find w when $P = 34$ m and $l = 11$ m. [2 marks]

$w = (34 - 22) \div 2 = 6$ m.

Answer: 6 m

10. A score is $S = 4a - 2b$. Find it for $a = 6$ and $b = -3$. [3 marks]

$S = 4(6) - 2(-3) = 24 + 6 = 30$.

Answer: 30

11. A rectangle side has length $(5x + 10)$ cm. [3 marks]

(a) Factorise the length expression. [1 mark]

Both terms share a factor of 5.

Answer: $5(x + 2)$ cm

(b) Interpret the factor 5 as a statement about lengths. [2 marks]

The product gives five copies of the bracketed length.

Answer: Five equal segments, each $(x + 2)$ cm long.

12. A machine uses $R = an + b$. Make n the subject and state the restriction on a. [3 marks]

Subtract b and divide by non-zero a.

Answer: $n = \frac{R - b}{a}$, $a \neq 0$

13. Ticket totals are modelled by $A = 6(n + 2) - 2n$ and $B = 4n + 12$. Do these always agree? Explain. [3 marks]

$6(n + 2) - 2n = 6n + 12 - 2n = 4n + 12$.

Answer: Yes, for every permitted n.

14. Jay tests expressions only at $x = 0$. Explain why this cannot prove equivalence, using $2x$ and $3x$. [3 marks]

Both give 0 when $x = 0$.

At $x = 1$, they give 2 and 3, so they are not equivalent.

Answer: They agree at 0 but differ at 1.

15. A teacher writes $6x^2 + 9x = 3x(2x + 3)$. [4 marks]

(a) Verify the equality by expanding the right-hand side. [2 marks]

Distribute $3x$ to both bracket terms.

Answer: $3x(2x + 3) = 6x^2 + 9x$.

(b) Explain why $3x$ is the greatest common factor of the original terms. [2 marks]

Both coefficients have greatest common factor 3; each term contains x, but the second term does not contain x^2.

Answer: The coefficient GCF is 3 and the lowest shared power is x.

16. A delivery costs $C = 8 + 2d$ dollars for d kilometres. The budget is 30 dollars. [4 marks]

(a) Make d the subject. [2 marks]

Subtract 8, then divide by 2.

Answer: $d = \frac{C - 8}{2}$

(b) Find the maximum whole-kilometre distance within the budget. Explain briefly. [2 marks]

$(30 - 8) \div 2 = 11$.

Each extra kilometre adds 2 dollars, so a larger distance exceeds the budget.

Answer: 11 km